

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A method for ~~selecting a value in a~~ distributed computing system, the method comprising:
performing a distributed fault-tolerant consensus process in a distributed computing system to coordinate execution of system functions by a plurality of computing devices implementing said distributed computing system, wherein performing a distributed fault-tolerant consensus process comprises:

transmitting a message from a first transmitting device to a first recipient device, said first transmitting device generating said message while acting as a leader device among the plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier,

wherein the vote for the proposed value in said message provides [[a]] the first recipient device sufficient information to determine, based on the vote for the proposed value and its own vote, whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

2. (Original) The method of claim 1 further comprising:

transmitting a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum provides a second recipient device sufficient information to determine, based on the vote for the proposal for the operational quorum and its own vote, whether a second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier; and

receiving an indication of the selection of the proposal for the operational quorum.

3. (Currently Amended) The method of claim 2, wherein the second quorum of the distributed computing system comprises a second transmitting device and the second recipient device, wherein the second transmitting device transmitted the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein the second recipient device is ~~an inexpensive a~~ computing device having limited computational ability and storage capacity.

4. (Currently Amended) A method for ~~selecting a value in a~~ distributed computing system, the method comprising:
performing a distributed fault-tolerant consensus process in a distributed computing system to coordinate execution of system functions by a plurality of computing devices implementing said distributed computing system, wherein performing a distributed fault-tolerant consensus process comprises

receiving by a first recipient device, a message transmitted from a first transmitting device acting as a leader device among the plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier,

wherein the vote for the proposed value provides sufficient information for the first recipient device receiving said message to determine whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

5. (Original) The method of claim 4 further comprising selecting the proposed value and transmitting, without waiting for additional messages, the selection of the proposed value to a client device that had originally proposed the proposed value, if the first proposal identifier is greater than or equal to a previously responded to proposal identifier.

6. (Original) The method of claim 4 further comprising:
receiving a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum provides sufficient information to determine whether a second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier;
selecting the proposal for the operational quorum if the second proposal identifier is greater than or equal to a previously responded to proposal identifier; and
transmitting an indication of the selection of the proposal for the operational quorum.

7. (Currently Amended) The method of claim 6, wherein the second quorum of the distributed computing system comprises a second transmitting device and a second recipient device, wherein the second transmitting device transmitted the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein the second recipient device received the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein ~~further~~ the second recipient device is ~~an inexpensive~~ a computing device having limited computational ability and storage capacity.

8. (Currently Amended) A computer-readable storage medium having computer-executable instructions ~~for selecting a value in a distributed computing system, the computer-executable instructions performing steps comprising~~ that are executable by a computer to perform a distributed fault-tolerant consensus method in a distributed computing system to coordinate execution of system functions by a plurality of computing devices implementing said distributed computing system, the distributed fault-tolerant consensus method comprising:
transmitting a message from a first transmitting device to a first recipient device, said first transmitting device generating said message while acting as a leader device among the

plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier,

wherein the vote for the proposed value in said message provides ~~[[a]]~~ the first recipient device sufficient information to determine, based on the vote for the proposed value and its own vote, whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

9. (Currently Amended) The computer-readable storage medium of claim 8, wherein the first quorum of the distributed computing system comprises ~~[[a]]~~ the first transmitting device and the first recipient device, ~~wherein the first transmitting device transmitted the proposed value, the vote for the proposed value, the first proposal identifier and the first step identifier.~~

10. (Currently Amended) The computer-readable storage medium of claim 8, wherein the proposed value is a proposed function to be executed by the distributed computing system.

11. (Currently Amended) The computer-readable storage medium of claim 10 ~~having~~ further comprising computer-executable instructions for performing steps comprising receiving, from the first recipient device, a result of an execution of the proposed function by the first recipient device.

12. (Currently Amended) The computer-readable storage medium of claim 8 ~~having~~ further comprising computer-executable instructions for performing steps comprising:

transmitting, to a second quorum of devices in the distributed computing system, a suggested next proposal identifier for the first system step; and

receiving, from each device in the second quorum of devices in the distributed computing system, a suggested next proposal identifier response, wherein the suggested next proposal identifier response is null if the each device in the second quorum of devices had not previously voted for the first system step, and wherein the suggested next proposal identifier response

comprises an indication of a previously voted for value and a previously voted for proposal identifier, corresponding to the first system step, if [[the]] each device in the second quorum of devices had previously voted for the first system step.

13. (Currently Amended) The computer-readable storage medium of claim 12 ~~having~~ further comprising computer-executable instructions for performing steps comprising:
selecting, as the first proposal identifier, a greater identifier than any of the previously voted for proposal identifier; and
selecting, as the proposed value, one of the previously voted for value.

14. (Currently Amended) The computer-readable storage medium of claim 8 ~~having~~ further comprising computer-executable instructions for performing steps comprising:
transmitting a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum provides a second recipient device sufficient information to determine, based on the vote for the proposal for the operational quorum and its own vote, whether a second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier; and
receiving an indication of the selection of the proposal for the operational quorum.

15. (Currently Amended) The computer-readable storage medium of claim 14, wherein the second quorum of the distributed computing system comprises a second transmitting device and the second recipient device, wherein the second transmitting device transmitted the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein the second recipient device is ~~an~~ inexpensive a computing device having limited computational ability and storage capacity.

16. (Currently Amended) The computer-readable storage medium of claim 14, wherein the operational quorum comprises the first quorum of the distributed computing system, and wherein the second system step precedes the first system step.

17. (Currently Amended) A computer-readable storage medium having computer-executable instructions ~~for selecting a value in a distributed computing system, the computer-executable instructions performing steps comprising~~ that are executable by a computer to perform a distributed fault-tolerant consensus method in a distributed computing system to coordinate execution of system functions by a plurality of computing devices implementing said distributed computing system, the distributed fault-tolerant consensus method comprising:
receiving by a first recipient device, a message transmitted from a first transmitting device acting as a leader device among the plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier,
wherein the vote for the proposed value provides ~~sufficient~~ information for the first recipient device receiving said message to determine whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

18. (Currently Amended) The computer-readable storage medium of claim 17, wherein the first quorum of the distributed computing device comprises ~~[[a]] the first transmitting device and [[a]] the first recipient device, wherein the first transmitting device transmitted the proposed value, the vote for the proposed value, the first proposal identifier and the first step identifier, and the first recipient device received the proposed value, the vote for the proposed value, the first proposal identifier and the first step identifier.~~

19. (Currently Amended) The computer-readable storage medium of claim 17 ~~having~~ further comprising computer-executable instructions for performing steps comprising selecting

the proposed value and transmitting the selection of the proposed value if the first proposal identifier is greater than or equal to a previously responded to proposal identifier.

20. (Currently Amended) The computer-readable storage medium of claim 17, wherein the proposed value is a proposed function to be executed by the distributed computing system.

21. (Currently Amended) The computer-readable storage medium of claim 20 ~~having~~ further comprising computer-executable instructions for performing steps comprising executing the proposed function, and transmitting a result of the execution of the proposed function.

22. (Currently Amended) The computer-readable storage medium of claim 21 ~~having~~ further comprising computer-executable instructions for performing steps comprising transmitting an indication of a selection of the proposed function.

23. (Currently Amended) The computer-readable storage medium of claim 17 ~~having~~ further comprising computer-executable instructions for performing steps comprising:
receiving a suggested next proposal identifier for the first system step; and
transmitting a suggested next proposal identifier response, wherein the suggested next proposal identifier response is null if no vote for the first system step was previously made, and wherein the suggested next proposal identifier response comprises an indication of a previously voted for value and a previously voted for proposal identifier, corresponding to the first system step, if a vote for the first system step was previously made.

24. (Currently Amended) The computer-readable storage medium of claim 17 ~~having~~ further comprising computer-executable instructions for performing steps comprising:
receiving a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum provides sufficient information to determine whether a

second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier;

selecting the proposal for the operational quorum if the second proposal identifier is greater than or equal to a previously responded to proposal identifier; and

transmitting an indication of the selection of the proposal for the operational quorum.

25. (Currently Amended) The computer-readable storage medium of claim 24, wherein the second quorum of the distributed computing system comprises a second transmitting device and a second recipient device, wherein the second transmitting device transmitted the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein the second recipient device received the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein further the second recipient device is ~~an inexpensive~~ a computing device having limited computational ability and storage capacity.

26. (Currently Amended) The computer-readable storage medium of claim 24, wherein the operational quorum comprises the first quorum of the distributed computing system, and wherein the second system step precedes the first system step.

27. (Currently Amended) A computing device in a distributed computing system, wherein the computing device is configured to perform acts for implementing a distributed fault-tolerant consensus algorithm, process to coordinate execution of system functions by a plurality of computing devices implementing the distributed computing system, said acts comprising:

the computing device transmitting a message to a first recipient computing device when said computing device is acting as a leader device among the plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier to a first recipient computing device,

wherein the vote for the proposed value in said message enables the first recipient computing device to determine whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

28. (Original) The computing device of claim 27, wherein the first quorum of the distributed computing system comprises the computing device and the first recipient computing device.

29. (Currently Amended) The computing device of claim 27, wherein the computing device is configured to perform further acts including:

transmitting, to a second quorum of devices in the distributed computing system, a suggested next proposal identifier for the first system step; and

receiving, from each device in the second quorum of devices in the distributed computing system, a suggested next proposal identifier response, wherein the suggested next proposal identifier response is null if the each device in the second quorum of devices had not previously voted for the first system step, and wherein the suggested next proposal identifier response comprises an indication of a previously voted for value and a previously voted for proposal identifier, corresponding to the first system step, if [[the]] each device in the second quorum of devices had, for the first system step, previously voted.

30. (Currently Amended) The computing device of claim 29, wherein the computing device is configured to perform further acts including:

selecting, as the first proposal identifier, a greater identifier than any of the previously voted for proposal identifier; and selecting, as the proposed value, one of the previously voted for value.

31. (Currently Amended) The computing device of claim 27, wherein the computing device is configured to perform further acts including:

transmitting a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum enables a second recipient computing device to determine whether a second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier; and

receiving an indication of the selection of the proposal for the operational quorum.

32. (Currently Amended) The computing device of claim 31, wherein the second quorum of the distributed computing system comprises the computing device and the second recipient computing device, and wherein the second recipient computing device is ~~an inexpensive~~ a computing device having limited computational ability and storage capacity.

33. (Currently Amended) A computing device in a distributed computing system, wherein the computing device is configured to perform acts for implementing a distributed fault-tolerant consensus algorithm, process to coordinate execution of system functions by a plurality of computing devices implementing the distributed computing system, said acts comprising:
the computing device receiving a message transmitted from a first transmitting device acting as a leader device among the plurality of computing devices, wherein the message comprises a proposed value, a vote for the proposed value, a first proposal identifier and a first step identifier,

wherein the vote for the proposed value in said message enables the computing device to determine whether a first quorum of the distributed computing system has selected the proposed value in a first system step identified by the first step identifier.

34. (Currently Amended) The computing device of claim 33, wherein the first quorum comprises the computing device and ~~[[a]]~~ the first transmitting computing device, wherein the

~~first transmitting computing device transmitted the proposed value, the vote for the proposed value, the first proposal identifier and the first step identifier.~~

35. (Currently Amended) The computing device of claim 33, wherein the computing device is configured to perform further acts including:

selecting the proposed value and
transmitting, without waiting for additional messages, the selection of the proposed value to a client computing device that had originally proposed the proposed value, if the first proposal identifier is greater than or equal to a previously responded to proposal identifier.

36. (Currently Amended) The computing device of claim 33, wherein the computing device is configured to perform further acts including:

receiving a suggested next proposal identifier for the first system step; and
transmitting a suggested next proposal identifier response, wherein the suggested next proposal identifier response is null if no vote for the first system step was previously made, and wherein the suggested next proposal identifier response comprises an indication of a previously voted for value and a previously voted for proposal identifier, corresponding to the first system step, if a vote for the first system step was previously made.

37. (Currently Amended) The computing device of claim 33, wherein the computing device is configured to perform further acts including:

receiving a proposal for an operational quorum, a vote for the proposal for the operational quorum, a second proposal identifier and a second step identifier, wherein the vote for the proposal for the operational quorum enables the computing device to determine whether a second quorum of the distributed computing system has selected the proposal for the operational quorum in a second system step identified by the second step identifier; selecting the proposal for the operational quorum if the second proposal identifier is greater than or equal to a previously responded to proposal identifier; and

transmitting an indication of the selection of the proposal for the operational quorum.

38. (Currently Amended) The computing device of claim 37, wherein the second quorum of the distributed computing system comprises the computing device and a second transmitting device, wherein the second transmitting device transmitted the proposal for the operational quorum, the vote for the proposal for the operational quorum, the second proposal identifier, and the second step identifier, and wherein the computing device is ~~an inexpensive a~~ computing device having limited computational ability and storage capacity.